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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Daniel Charles Coy et al.

Serial No.: 10/849,283

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Title: APPARATUS AND METHOD FOR CLASSIFYING FINE PARTICLES INTO
SUB AND SUPRA MICRON RANGES WITH HIGH EFFICIENCY AND
THROUGHPUT

Examiner: ---

Art Unit: 3653

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Dear Sir:

The above-referenced application is a continuation of prior application No. 10/047,552 filed January 14, 2002. In the prior application, claims 22-67 were pending during prosecution and were filed as claims 1-46 respectively in the above-referenced application.

During prosecution of the prior application, the Examiner issued an Office Action dated November 19, 2003, in which the Examiner: (1) objected to claims 38-54 and claims 51-54 under 37 CFR §1.75(c); (2) objected to the amendment filed 9/5/03 under 35 USC §132; (3) rejected claims 42 and 59 under 35 USC §112; (4) rejected claims 22-31, 33-38, 40, 41, 46-50, 55, 57, 58, and 63-67 under 35 USC §102(b); and (5) rejected claims 44, 45, 61, and 62 under 35 USC §103(a). As claims 22-67 in the prior application correspond to claims 1-46 respectively in the above-referenced application, Applicant addresses the Examiner's rejections below.

Objections Under 37 CFR §1.75(c)

In the prior application, the Examiner objected to claims 38-54 under 37 CFR §1.75(c) as being of improper dependent form. Claims 38-54 in the prior application correspond to claims 17-33 in the above-referenced application. Applicants have written claim 17 (prior claim 38) in independent form and respectfully submit that claims 18-33 are in proper dependent form.

In the prior application, the Examiner also objected to claims 51-54 under 37 CFR §1.75(c) as being of improper dependent form. The Examiner alleges that the limitations of claims 51-54 fail to further limit a method of use. Claims 51-54 in the prior application correspond to claims 30-33 in the above-referenced application. Applicants respectfully submit that the limitations of claims 30-33 do further limit a method of use and are in proper dependent form.

Claims 30 and 31 both further limit the step of “providing the settling chamber with a top section and a bottom section, an outlet port positioned on the top section, and an inlet port positioned on the bottom section, wherein a ratio of height to width of the settling chamber is greater than 0.7” as recited in claim 17. Claim 30 further limits claim 17 by reciting that the settling chamber provided must also have a bottom section that is cylindrical, in addition to the other settling chamber limitations recited in claim 17. Similarly, claim 31 also further limits claims 30 and 17 by reciting that the settling chamber provided must also have a bottom with a diameter of 48 inches, in addition to the other settling chamber limitations recited in claim 17.

Claims 32 and 33 both further limit the step of “introducing a gas fluidized particle stream through the inlet port at a given volume flow rate” as recited in claim 17. Claims 32 and 33 further limit claim 17 by reciting a minimum and maximum volume flow rate, respectively, at which the gas fluidized particle stream is introduced.

Objection Under 35 USC §132

In the prior application, the Examiner objected to claims 43 and 60 under 35 USC §132 alleging that there was no support for the “radial introduction of the gas” limitation in the specification. Claims 43 and 60 in the prior application correspond to claims 22 and 39 in the above-referenced application. Applicants respectfully submit that there is support for the “radial introduction of the gas” limitation in claims 43 and 60 in the original specification.

Applicants direct the Examiner to Figure 3 which illustrates the radial introduction of the gas. In addition the specification discloses the “inlet port is located in a side of the bottom section” [paragraph 0023] and “the inlet port is constructed about a substantially horizontal axis and the axis of the inlet port is substantially perpendicular to the axis of the bottom and top sections [paragraph 0026]. This is the definition of a radial inlet. Therefore, the “radial introduction of the gas” limitation in claims 43 and 60 is supported in the original specification.

Rejections Under 35 USC §112

In the prior application, the Examiner rejected claims 42 and 59 under 35 USC §112, second paragraph alleging that it is not clear "how the axes of rotation of the flow patterns are primarily horizontal." The Office Action further states, "if the streams are perpendicular to the inlet stream, then it would seem to dictate that the axes of rotation of the flow patterns are primarily vertical." Claims 42 and 59 in the prior application correspond to claims 21 and 38 in the above-referenced application.

The axes of rotation of the flow pattern are primarily horizontal and perpendicular to the inlet stream. It is three dimensional space--the inlet is the x-axis, the vertical is the z-axis, and the axes of rotation of the flow pattern are parallel to the y-axis. Further, the gas-fluidized fine particle stream is circulated inside the classifier vessel in such a manner as to define flow

patterns within the vessel. This provides for physico-chemical conditions whereby particles having a size greater than about 10 microns are separated from smaller particles which enables particle separation in the invention. These physio-chemical conditions are two recirculating sympathetic vortices. One large recirculating vortex is formed where the flow enters the chamber and a second sympathetic vortex is formed above the first. Various geometries will allow this, including a conical top or a taller chamber with a flat top. It is also well known to those skilled in the art that it is difficult to transport mass (including large particles) from one vortex to another, as they are "closed" systems.

It is another aspect of the present invention that the gas velocity at all surfaces is sufficiently low that large particles are not re-entrained in a low-density electro-static mass. The prior art typically uses baffle plates, which have been proven to fail in the application of interest to the present invention (illustrated in Fig. 1 and Fig. 2 of the present application). Therefore, Applicant submits that the specification does describe how the axes of rotation of the flow patterns are primarily horizontal as recited in claims 21 and 38.

Rejections Under 35 USC §102(b)

In the prior application, the Examiner rejected claims 22-31, 33-38, 40, 41, 46-50, 55, 57, 58 and 63-67 under 35 USC §102(b) as anticipated by Zelazny et al. Claims 22-31, 33-38, 40, 41, 46-50, 55, 57, 58 and 63-67 in the prior application correspond to claims 1-10, 12-17, 19, 20, 25-29, 34, 36, 37, 42-46 in the above-referenced application. Applicants respectfully submit that claims 1-10, 12-17, 19, 20, 25-29, 34, 36, 37, 42-46 are not anticipated by Zelazny et al.

Zelazny et al. discloses a porous membrane which operates as a baffle and has a flow pattern which is vertical (Fig 1). It is well known to those skilled in the art that gas streams with commercially significant loadings of electrostatically or "sticky" nanoparticles can plug or clog

even extremely coarse porous membranes. After the membrane clogs, the membrane begins to act as a baffle, or impingement plate. This configuration has been shown to be ineffective in the field of application of the present invention (see Fig. 1, Fig. 2, and paragraphs 5-7).

Further, the applicants respectfully submit that Zelazny et al. does not disclose most features recited in the claims of the present invention. For example, Zelazny et al. is silent with respect to the height and width of the cyclone disclosed so it can not be inevitable from the disclosure that a ratio of height to width of the settling chamber is greater than 0.7. Further, there is no mention in Zelazny et al. of a ratio of height to width of the settling chamber greater than 0.7, a ratio of the size of the base to the size of the inlet port of approximately 4 to 1, introducing gas fluidized particle streams at a given velocity of 10 to 1,000 scfm, and introducing a gas fluidized particle stream comprising particles having a minimum particle size of approximately .001 micron. Zelazny et al. simply does not disclose “establishing a mainly circulating flow pattern in the bottom section” and “establishing a secondary recirculating flow pattern in the top section” as in the claims. Zelazny et al. is a simple cyclone separator and Applicants are aware of no teaching that would indicate that simple cyclone separators inherently form multiple flow patterns. In fact, Fig. 1 of Zelazny et al. would seem to indicate the opposite. Therefore, Applicants submit that Applicants respectfully submits that claims 1-10, 12-17, 19, 20, 25-29, 34, 36, 37, 42-46 are not anticipated by Zelazny et al.

Rejections Under 35 USC §103(a)

In the prior application, the Examiner rejected claims 44, 45, 61 and 62 under 35 USC §103(a) as being unpatentable over Zelazny et al. Claims 44, 45, 61, and 62 in the prior application correspond to claims 23, 24, 40, and 41 in the above-referenced application. Applicants respectfully submit that claims 23, 24, 40, and 41 are patentable over Zelazny et al.

Figure 2 of the Zelazny et al. reference discloses a simple cyclone separator with the lower discharge removed is disclosed. The upper portion of this apparatus operates as a cyclone and is different from the present invention, as discussed above. Further, the method disclosed by Zelazny et al. involves operation at 4500 ft/min resulting in a separation cut-off of 500 microns. The present invention contemplates such low levels of separation performance as being far below the acceptable performance of standard equipment (see Fig. 1, Fig. 2, and paragraph 20). Zelazny et al. does not disclose or teach the formation of an interface or the formation of a flow pattern as is taught in the present invention, because neither an interface nor a flow patterns occur in the Zelazny et al. devices. Therefore, Applicants submit that claims 23, 24, 40, and 41 are patentable over Zelazny et al.

Conclusion

In view of the aforesaid, Applicant respectfully submits that claims 1-46 are in condition for allowance and a Notice of Allowance for these claims is respectfully requested.

Dated: 08/16/04

Respectfully submitted,

By:

Annette M. McGarry

Annette M. McGarry

Reg. No. 34,671

Attorney for Applicant

Wildman, Harrold, Allen & Dixon LLP

225 West Wacker Drive

Suite 3000

Chicago, IL 60606

P: 312-201-2000

F: 312-201-2555

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